

ON THE APPLICATION OF
SULPHUROUS ACID GAS

TO THE
PREVENTION, LIMITATION, AND CURE OF
CONTAGIOUS DISEASES.

BY
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EDINBURGH:
EDMONSTON AND DOUGLAS, 88 PRINCES STREET.
LONDON: HAMILTON, ADAMS, AND CO.

1866.

Price Sixpence.

ON DISINFECTION

BY

SULPHUROUS ACID GAS AND ITS COMPOUNDS.

“Il ne reste plus à découvrir que la matière parasiticide (insecticide), gaz, poudre ou liquide, qui détruira ces vampires de l'air.”—CHAILLOU, *February* 1866.

As the term “disinfection” presupposes the existence of some vital principle of which it is desirable that one should be rid, and at the same time a conviction that our safety from its deleterious influence lies in the practice of some unusual process which shall insure its destruction, it only remains to select *that one* whose efficiency is paramount; and if such combine economy with facility of production, as well as of application, it will the more necessarily commend itself to our choice. In fumes of sulphur all

these conditions are conveniently presented to us, combined with efficiency in the most reliable degree.

Sulphurous Acid Gas has been long known and used as a disinfectant of empty apartments, ships, etc.; but its practical usefulness was much curtailed by the unnecessary restrictions imposed regarding it, under the mistaken belief that its fumes could not be, to any extent, inhaled without deleterious consequences. This danger, however, experiment at once proved to have been exaggerated, and accordingly we find now that it can be beneficially and freely applied under circumstances in which formerly it was believed to be forbidden; and I only know of one instance in which the practice was attended by disagreeable results, and that was in a case of chronic bronchitis, in which the consequent difficulty of breathing was very distressing.

Before entering upon the subject of the present memoir, it may be well to premise that our adoption of such an auxiliary implies a belief that the enemy of which we are in pursuit lurks about indefinitely ; that its vitality can outlive ordinary processes of decay ; and that it is transmitted by, or at least is located in the atmosphere. This being the case, we may as well assume that the germs are of parasitic, most of them of vegetable, origin ; that some retain their peculiar properties, independent of temperature or climate ; and that some even can (as in cholera) in a dry climate, in the form of dust, be carried by the wind to distant points, where, as they absorb moisture, they regain their power of spreading devastation.

As a few practical facts are worth pages of theory, I will now explain the method by which the process here recommended is conducted ; and the first experiment, I beg

to be understood, refers to the plan being carried into operation in byres or apartments *occupied by their ordinary tenants*; and as this can be accomplished not only without detriment to them, but to their positive advantage, there need be no hesitation as to its adoption. "Sulphurous Acid Gas," which is evolved when sulphur is burned in the open air, is fatal to all parasitic germs; and as it has been by experience proved that man and other animals can safely respire an atmosphere admixed with it to such a degree as can forbid the co-existence of any such dangerous influences, we may easily render the objects of our interest inaccessible to them and that by a very simple mode of procedure.

My experiments having been instituted more particularly in connection with Cattle Plague, I am therefore most conversant with the system as it has been practised

in byres, etc.; and accordingly I find that the most convenient and safest apparatus consists of *a chaffer two-thirds full of red cinders, a crucible inserted therein, and a piece of sulphur stick.*

A piece of sulphur of the length of a man's thumb will burn for about twenty minutes, and will be amply sufficient for a byre containing six cattle; and if the usual attention has been paid to means of ventilation, which ought to be constant in their operation, the attendant may shut himself in along with the cattle without the slightest risk of detriment to either.

My own cattle have been thus treated for nearly four months, four times a day, and hundreds of others likewise, to their manifest enjoyment; and many of my friends and correspondents are so satisfied of the general advantages arising from its use, that they have intimated to me their intention of continuing the practice, irre-

spective of the existence of any special epidemic. That exposure to the fumes directly, as well as indirectly, conduces to the animal's health, all of them admit; and the "blooming condition" of those which have the benefit of it, is of itself sufficient evidence of its hygienic virtues. This it no doubt effects partly through its recognised tonic attributes, but also, and perhaps in a no less important degree, by its securing them, in virtue of its disinfecting properties, against the depressing influence of those elements of decomposition, with which the air is contaminated, and with which otherwise they are left to contend; for it should ever be borne in mind that scrupulous sanitary measures—in other words, cleanliness and pure air—strictly enforced, of themselves, play no unimportant part in the management of epidemics. These facts, confirmatory of its prophylactic attributes,

alone possess abundant scientific and social interest ; but they are completely overshadowed by the unexpected revelation, that Sulphurous Acid Gas is practically available for protection from, and the cure and even extirpation of, various contagious and other diseases.

It will simplify the understanding of what follows, if it be taken for granted that the terms “contagious” and “epidemic” are essentially of the same import ; for in the one case the individual goes to the poison, while in the other the poison finds its way to the individual. As to the entire competency of the simple process under consideration for the duty in regard to which these experiments were first instituted, no one familiar with such matters will readily question ; and although Cattle Plague, like other epidemics, is admittedly capricious in its course and progress, it is as reassuring as it is gratifying to be able

to state that, out of scores of homesteads *where the system has been, from first to last, thoroughly and determinedly practised*, there has not been, as far as I have been able to learn, any case of illness, not to say of death, among cattle from any epidemic cause whatever. And not only so, but this has also been accompanied by the disappearance of those ailments whose recurrence could be foretold as confidently as that of the seasons of the year,—viz., ring-worm, mange, angleberries, lice, etc.; and where such existed, before the system was utilised, their cure and extirpation were very easily attained. A horse, *malgré lui*, likewise reaped benefit from the process; for having been a few times unintentionally fumigated, the owner was amazed to find that obstinate “grease of the heels” had meantime been cured.

Over pleuro-pneumonia, too, it would seem to enjoy an equal power of extinc-

tion ; of which the following case affords strongly conclusive evidence.

A large dairy in this immediate neighbourhood has, I have been informed, for nearly *thirty* years maintained a notorious character for mortality among its cows. The present tenant, during his occupancy of about eight years, had never been, up to the 1st of November last, *one* whole month without having this disease among his stock ; and within twelve months of that date he had buried *sixteen* cows, the last of these *only three days* before he began to fumigate. *From that time till now* his byres have been *perfectly healthy*.

Among the attendants upon cattle, where the system has been faithfully attended to, chilblains and chapped hands have been entirely unknown ; and many, to whom these pests were the only trouble in life, have with perfect success fumigated themselves, alike for their prevention and cure.

In a very fatal epidemic among sheep, the symptoms and morbid appearances in which were so very similar to what I had witnessed in cattle as to leave no doubt, in my mind, as to its close relationship, at least, to Rinderpest, the results of the experiment were eminently satisfactory where the remedy was heartily and honestly applied, this having been speedily followed by amelioration in the form, as well as limitation in the spread, of the malady.

There is yet another aspect, and the most interesting, because most unexpected and most important of all, in which we are encouraged to look hopefully for some help in sulphur. The case to which I more particularly refer was one of advanced phthisis in the person of my own groom, whose downward progress others, as well as myself, watched with hopeless concern. Previous to January last he had for

months been wasting,—coughing, spitting blood repeatedly, and sweating profusely. His death was reported again and again, and to such an issue both he and I had looked forward as inevitable. I had got, one day, some cattle for experiment from a farm where the disease was raging (and which was cleared out within *ten* days thereafter); and although C. was quite unfit for any exertion, as I could depend upon his fidelity for superintending the process, I begged that he *would endeavour to see* it done for fourteen days or so (the critical time), lest infection should have been imported with them. He said he would try, and at once proceeded with the plan, which he has up to this day conducted with perfect success, as far as my cattle are concerned (they are the only living ones of the original herd), *and with the most wonderful benefit to his own health* which can be conceived. Within one week, the night-sweats

had ceased ; his cough gradually abated, and the expectoration diminished ; and he has progressively gained weight, as he says, nearly two stones within four months. He is now dependent for his life upon one lung only, or nearly so ; but, with the exception of his being somewhat short-winded,—for a like reason that a man with only one leg must of necessity be lame,—he looks nearly as strong, and is as able for ordinary stable-work as he was previous to his illness. I have shown this case to Professor Sir J. Y. Simpson, Bart., and other professional friends in Edinburgh who are quite conversant with the facts regarding it.

Another and somewhat similar instance is that of a young woman of twenty, who for some months before the last week of March had been wasting, coughing, etc. I saw her then for the first time, and told her about fumigating. She at once

adopted it, and has since filled her room with "fumes" three times a day with manifest advantage; for, while there is still evidence of extensive pulmonary disease (*over which we are as yet ignorant whether they can exercise any permanent sanatory influence*), her condition has manifestly improved, and her cough been materially relieved. She tells me that she used to weary for the time coming, as the process uniformly gave her a feeling of relief. She is now able to be out of bed half the day; and her mother reports that she "sleeps like a child."

Another case of "chronic phthisis" in a female of thirty has been wonderfully soothed by the same means, which always induce in her a desire to sleep, and to which blessed restorative she had been long a stranger, until the idea of comfort in this way was suggested to her.

Two middle-aged men, similarly affected,

as reported to me by well-qualified professional brethren, in different parts of the country, have equally benefited by the system, under very unpromising circumstances; and many in this neighbourhood have had recourse to it in the domestic management of obstinate colds, with the most favourable results. In several cases of children, likewise, liable to anomalous but frequent attacks of feverish cold, it has proved of the greatest service.

These interesting facts regarding the use of Sulphurous Acid Gas, in connection with diseases of the chest, are not adduced as by any means conclusive evidence of sanatory value; but the unlooked-for issue of the experiment, in so far as it has in no instance been attended by otherwise than beneficial results, surely warrants farther and wider investigation.

An epidemic of "diphtheria," which ap-

peared in a bothy of journeymen gardeners, under my own care, was at once cut short by it. One case, then a second, occurred within twenty-four hours, and a third man was *suspiciously* shivering at the fireside. Two fumigations cured them. It went no farther, and all the men were at work on the *second day* thereafter.

The results of experience of this mode of treating recognised epidemic and other diseases lead to the conviction that many of these, although apparently dissimilar, in reality have many points of resemblance, and certain common relations, both of origin and existence. Our opportunities for closely observing facts have been much too limited to admit of any positive deductions; but, such as they are, they converge towards establishing the plausible theory of the dependence of many of these upon the presence of poisonous fungi; and that such agencies are constant in their operation is

proved by this fact, that all that is requisite to insure their speedy manifestation is to present to them the conditions favourable to their propagation. That they are indestructible by the ordinary natural processes can be familiarly proved by the certain *re-appearance* of ringworm, etc., in places *once* infected, and that they are ever ready to take us at a disadvantage, chilblains and chapped hands give annually too many painful illustrations. That these latter affections should have anything in common with consumption, few will be prepared to believe ; but when we find all of them associated with, and doubtless dependent upon, the presence of an infinitesimal fungus, the apparent discrepancy will at once vanish. “*Fungi*” are found to exist in connection with ulcers of various sorts, chapped hands, etc. ; and on exposure to Sulphurous Acid Gas, *these plants die*, and *the ulcers*

quickly heal. *Fungi* have been detected both in the sputa of phthisical patients, and also in the cavities from which such were expelled ; and I think that there is justifiable reason to believe that this ulceration of the *lung may* have a like dependence upon the presence of a lurking parasite, as these ulcers have which exist upon the *surface* of the body. *Faute de mieux*, this is a warrantable theory, which is moreover substantiated by the somewhat marvellous and otherwise inexplicable results of the experience of "Sulphurous Acid Inhalation."

In verification so far of the foregoing deeply interesting and important facts, it is with no small feeling of satisfaction that I refer to the opinion of Dr Halliday Douglas, of Edinburgh, whose name will be considered an ample guarantee for accuracy of diagnosis ; and of the impression which the cases referred to made upon

him, the subjoined memorandum gives a very succinct detail; and that upon the whole it was a favourable one, is best evinced by his expressed intention of putting the matter to the test of farther experiment.

Upon a topic of such grave individual and social interest, it behoves us to speak warily, lest, by permitting ourselves to be over-sanguine, we should reap only disappointment; but I think it is not unwarrantable to look to this unhopèd-for expedient as a means of immediate practical good, in' that weary cachectic state which precedes more definite morbid conditions. "The fumes" can be safely breathed even by young children, in whom I have known *nameless delicacy* decidedly benefited by it. By reason of its acknowledged tonic virtues, too, it will doubtless fortify them against those ever-recurring colds which, in more ways than one, conduce to the de-

velopment of more serious mischief ; and as the air, mixed with this gas, must of necessity be purified from every noxious element, we are encouraged to the adoption of the process by the well-founded prospect of deriving from it speedy and varied advantage.

So much for the applicability of this process to the persons *of living animals* ; but it is capable of extensive utilisation in the direction of disinfecting “inanimate objects.” In this instance we may at once, and without scruple, proceed to intensify the “sulphurous vapour” by whatever means we can conveniently command. Steam can anywhere be improvised without much difficulty ; and this of itself is an important adjunct, of the sufficiency of which as a disinfectant, in combination with *the* fumes, one experiment will suffice to convince the most incredulous. The simple addition of a little nitre, however,

inconceivably strengthens our hands in the process ; and I sincerely trust, therefore, that a process of such undeniable efficiency may be kept in view in the official instructions as to “disinfection” generally. Fumes and steam are, in all probability, sufficient for every purpose ; but as the addition of a little nitre extemporises *vitriol in vapour* it may easily be understood how its power should be irresistible, while its facility of application would render it peculiarly suited to the purification of inanimate objects, combining as it does the *maximum* of energy with the *minimum* of expense. Hides, in this way, could be *made safe* at less than twopence each, exclusive of a merely nominal expenditure of manual labour ; and as the disinfectant is present in a state of vapour, its equal and thorough application to everything within reach is, by the very nature of things, secured.

And if the operation of thorough purification is to be carried out so as to afford complete security, some means must be employed to *insure* the annihilation of those germs, against which our efforts are directed. Let, therefore, the cleansing of byres, etc., be preceded by, carried on and completed *during*, the process of dry fumigation, which, if properly conducted, will necessarily render them incapable of farther evil influence. The use of "lime," *in the first instance*, ought to be authoritatively forbidden; for the only good of "whitewash" will be to conceal and imprison the poison, which may at any time be released, to repeat to us its tale of disaster.

The latest official instructions upon this subject are antiquated, cumbersome, and insufficient; for of what practical value can the "burning of sulphur underneath a bale of wool" have upon insuring its sani-

tary safety? Fumes, *under ordinary pressure*, will not enter the substance of the bale ; so that, in reality, the process as recommended is to little purpose.

Another direction in which fumes might be turned with advantage, is to the purification of common sewers ; for, with the help of steam power, they might be made to permeate every hole and corner, with the best results, and at little expense. At any time the system might be carried into operation with salutary benefit, but more especially in case of drought it would secure us from one of its attendant evils, and would at the same time enable us to economise our supplies of water.

In conclusion, permit me to say a few words about the conditions and circumstances under which alone parasites can successfully invade the animal body. Of these, depreciation of constitutional vigour is the most immediately important, as

offering to those noxious cells, by which we are ever surrounded, a soil suited for their germination ; and as this state of *lowered* vitality is readily engendered, and certainly aggravated, by neglect of strict personal as well as social sanitary observance, it will easily be understood in how far we may be said with truth to have occasionally our lives in our own hands.

The foregoing data so far attest that the prophylactic agency of Sulphurous Acid Gas can be safely and with confidence relied upon for the prevention and limitation of epidemic diseases. And surely there could not be a more appropriate time than the present for directing public attention to any means by which such scourges can be warded off, or their virulence moderated ; for, with the ominous knocking of cholera at our doors, it is full time for us to be upon the alert

to do our very utmost to remove every sanitary defect, the ignoring of which, it has been over and over again proved, invites their approach and favours their dissemination.

Next comes the question of *limitation* ; and a word of explanation will at once show the importance of intelligent attention to the means recommended for this important end. The best authorities tell us that it is in *the bowel discharges* that the germs of such diseases exist, and that it is in these, upon exposure to atmospheric air, that they more especially multiply, with a rapidity and to an extent that is inconceivable ; hence the unspeakable importance of having *such instantly disinfected* by some convenient and trustworthy agent. In either diluted Sulphuric or Sulphurous Acids will be found an economical and infallible remedy, which ought upon every occasion to be and *at once* had recourse to.

For the preservation of attendants, and perhaps to the direct advantage of the patient, fumigation by sulphur fumes may be practised constantly or as frequently as to insure *a permanent taint* in the apartment ; and as the general testimony in my experience bears towards its *exhilarating* effects, this property alone is one of the most material interest in the management of diseases of a class that test to the uttermost the resources of the most vigorous constitution.

Since the above was written, I have perused with interest an article in the *Medical Times and Gazette*, in regard to Dr Giovanni Polli's experiments with sulphites and hyposulphites of potass, etc., etc. He proposes, by their administration, to render animals insusceptible of zymotic changes (fermentation). It will easily be appreciated that the active agent, "Sulphurous Acid," should find access to the

blood more readily by "inhalation" than by any other mode of introduction; and it possesses the double advantage of enabling the blood to resist the action of the germ which does the mischief, and of exercising upon such germ the power of extermination.

APPENDIX.

James Dewar, Esq., M.D., Kirkcaldy.

KINROSS, 3d May 1866.

DEAR SIR,—In terms of the instructions of the Commissioners of Supply for this county, I have much pleasure in forwarding to you the annexed extract from the minutes of the annual general meeting here on Monday last.—I am, etc.,

RO. BURNS BEGG, JUN.,
Clerk of Supply.

EXTRACT from MINUTES of ANNUAL GENERAL MEETING
of the COMMISSIONERS of SUPPLY for KINROSS-SHIRE,
held at Kinross on 30th April 1866 ;—

HARRY YOUNG of Cleish, Convener of the County, in the chair.

“On the motion of Mr Brown Morison of Finderlie, a vote of thanks was unanimously accorded by the meeting to Dr James Dewar, Kirkcaldy, for the great trouble he has taken, and the valuable aid he has given, in this and the adjoining counties, in reference to the use of Disinfectants under the Cattle Diseases Prevention Act ; and the Clerk of Supply was instructed to write to Dr Dewar, with an extract of this resolution.”

RO. BURNS BEGG, JUN.,
Clerk of Supply for Kinross-shire.

MEMORANDUM by A. HALLIDAY DOUGLAS, Esq., M.D.,
F.R.C.P., Edinburgh.

33 QUEEN STREET,
EDINBURGH, 7th May 1866.

I HAVE been strongly impressed by the simplicity of Dr Dewar's process for employing Sulphurous Acid Gas as a disinfectant in the Cattle Plague. The importance of the subject demands that the plan should be thoroughly and speedily tested; but, at present, I mean to refer to the important influence Dr Dewar has observed sulphur fumigations to exert on diseases in the human subject.

At the request of Dr Dewar, I visited with him, on the 5th inst., three cases in which the patients had been subjected to sulphur fumigations, for periods varying from three months to three weeks, with results which are very remarkable. In each of these cases, tubercular disease of the lungs had occasioned some of its worst effects; and, according to the account the patients give of themselves, a marked and very cheering mitigation of their distress had thus early followed the use of the fumigation.

The first case was that of A—— C——, aged 44. He presented the appearance of broken health, but was able to follow his employment as Dr Dewar's stable-servant. He did not appear breathless, though he had ascended a long stair to see me; he had no cough, and said he had gained a stone and a half in weight.

On examination, I found the signs of disease of the right lung. The lung expanded imperfectly during inspiration, and consequently the positive indications of disease were not strongly marked. From his existing condition, however, and from the history he gave of his illness, I had no difficulty in determining that he had been suffering from

tubercular disease of the lung, which appeared to have originated in a preceding attack of pleuro-pneumonia.

Three months ago, he was helpless from exhausted strength and emaciation, with harassing cough and expectoration.

The second case was that of a girl, A——, aged 20, whose case may be described along with that of the remaining patient, a young woman, —— ———, aged 28.

Both patients presented the ordinary appearance observed in the third stage of phthisis pulmonalis. Both were emaciated, and had suffered from harassing cough, night sweats, and sleeplessness. In the former, the deposit of tubercle appeared to involve chiefly the left lung; and the signs of excavation of the lung were not very decided. In the latter case, both lungs had suffered from the deposit, and the unmistakable signs of excavation existed over the upper parts of both lungs. In this case, the symptoms of the disease had existed for two years.

Both of these patients spoke to me in the strongest terms of the comparative comfort they had enjoyed under the fumigation treatment. "Their cough had become less harassing;" the "night sweats had ceased;" and they "slept night after night for three, four, or five hours, uninterrupted;" and "waking in the early morning, they slept again, as they had not done for months before."

These results, though incomplete, are most encouraging, and demand the farther investigation of the subject. I have accordingly taken steps for the construction of a chamber for employing sulphur fumigation in connection with The Chalmers Hospital, where I shall be able to test the remedy forthwith.

A. HALLIDAY DOUGLAS.

Schenck and M'Farlane, Printers, Edinburgh.